

Robustness assessment for progressive collapse of framed structures using pushdown analysis method

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Abstract

One primary goal of structural design is to avoid progressive collapse when encountered great earthquakes or other abnormal loads, so that it can leave enough time for escaping, protecting people's lives and property. However, there is neither a uniform theory of structural robustness assessment nor a general methodology for quantification of the progressive collapse resistance of real complex structures.

In this paper, the residual reserve strength ratio is taken as a quantitative index to assess the robustness of frame structures. To obtain the progressive collapse resistance of damaged structures, a pushdown analysis method is developed herein, which considers the effects of the instant and duration of element removing as well as the locations of the removed elements. The proposed method is applied to a RC framed structure which is simulated by fiber section based beam elements with plastic hinges by OpenSees. It is demonstrated by this example that the approach is efficient and applicable for quantitative robustness assessment of complex structures in real world.

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